December 2011 MSS/LPS/SPS Joint Subcommittee Meeting
ABSTRACT SUBMITTAL FORM

The submission of an abstract is an agreement to complete a final paper for publication and attend the meeting to present this information. Complete all information requested in the author and co-author information sections; the first author listed will receive paper acceptance notices and all correspondence. Abstracts must be submitted electronically; submittal instructions are located in the call for papers. **The abstract deadline date is June 13, 2011.**

ABSTRACT INFORMATION

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MANAGEMENT APPROVAL

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Unclassified Abstract

(250-300 words; do not include figures or tables)

New NASA launch vehicles will require development of robust systems in a fiscally-constrained environment. NASA, Department of Defense (DoD), and commercial space companies routinely conduct ground vibration tests as an essential part of math model validation and launch vehicle certification. Although ground vibration testing must be a part of the integrated test planning process, more affordable approaches must also be considered. A study evaluated several ground vibration test options for the NASA Constellation Program flight test vehicles, Orion-1 and Orion-2, which concluded that more affordable ground vibration test options are available. The motivation for ground vibration testing is supported by historical examples from NASA and DoD. The approach used in the present study employed surveys of ground vibration test subject-matter experts that provided data to qualitatively rank six test options. Twenty-five experts from NASA, DoD, and industry provided scoring and comments for this study. The current study determined that both element-level modal tests and integrated vehicle modal tests have technical merits. Both have been successful in validating structural dynamic math models of launch vehicles. However, element-level testing has less overall cost and schedule risk as compared to integrated vehicle testing. Future NASA launch vehicle development programs should anticipate that some structural dynamics testing will be necessary. Analysis alone will be inadequate to certify a crew-capable launch vehicle. At a minimum, component and element structural dynamic tests are recommended for new vehicle elements. Three viable structural dynamic test options were identified. Modal testing of the new vehicle elements and an integrated vehicle test on the mobile launcher provided the optimal trade between technical, cost, and schedule.